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BASF Corporation Patent Department 500 White Plains Road P.O. Box 2005 Tarrytown, NY 10591			YAMNITZKY, MARIE ROSE	
			ART UNIT	PAPER NUMBER
			1786	
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

andrea.dececchis@basf.com  
deborah.pinori@basf.com  
sonny.nkansa@basf.com

# Office Action Summary

**Application No.**

10/531,780

**Applicant(s)**

SCHAFFER ET AL.

**Examiner**

Marie R. Yamnitzky

**Art Unit**

1786

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 11 November 2010 and 10 December 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 46-53 and 63 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 46-53 and 63 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-946)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB-08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

1. This Office action is in response to applicant's request for reconsideration filed November 11, 2010, and applicant's amendment filed December 10, 2010, which amends claim 46 and adds claim 63.

Claims 46-53 and 63 are pending.

2. Claims 46-53 and 63 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

If the language of present claim 46 requires that each of the three layers (i.e. layers b), c) and d)) comprise an organic compound of formula I, then the claims are not supported by the original disclosure.

If the language of present claim 46 requires that at least one of the three layers comprise an organic compound of formula I, then the claims are not fully supported by the original disclosure because devices in which a compound of formula I is present in layer b) or layer d), wherein layers b) and d) are separate/distinct from layer c), are not supported by the original disclosure.

The original disclosure does not describe a device in which a compound of formula I is used in three separate/distinct layers of a device, wherein one of the three layers functions as a hole injecting and/or hole transporting layer, another of the layers functions as a light emitting

layer, and a third layer of the three layers functions as an electron transporting layer. The original disclosure also does not describe a device in which a compound of formula I is used in a hole injecting and/or hole transporting layer that is separate/distinct from the light emitting layer, and does not describe a device in which a compound of formula I is used in an electron transporting layer that is separate/distinct from the light emitting layer. Rather, the original disclosure teaches the compounds of formula I as light emitting materials for use in a light-emitting layer of an EL device.

While the specification teaches that these light emitting materials are also capable of injecting/transporting holes and injecting/transporting electrons, the specification repeatedly teaches the compounds of formula I as light emitting materials, and repeatedly teaches the use of the compounds in a light emitting layer of an electroluminescent device. The teachings regarding suitable materials for a separate hole injecting and/or hole transporting layer, and for a separate electron transporting layer, (i.e. layers separate from the light emitting layer) do not mention the compounds of formula (I), or pyrimidine compounds in general (e.g. see page 36, line 32-p. 39, l. 11). It is the examiner's position that the original disclosure provides support for devices in which a light emitting layer comprises a compound of formula I, wherein the light emitting layer may also function as a hole transporting layer and/or electron transporting layer, but does not provide support for devices having the three distinct functional layers wherein each of the three layers comprises a compound of formula I, or in which layers b) and d) are distinct from layer c) and at least one of b) and d) comprises a compound of formula I.

3. Claims 46-53 and 63 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Based on the insertion of the phrase "in this order" in the first line of claim 46, layers b), c) and d) of the claimed device must be separate/distinct layers between the anode and the cathode. Claim 46 has also been amended to further define b), c) and d) as organic compound layers, and to recite "and wherein said organic compound layers comprise an organic compound of formula I". It is not clear if the amended claim language requires that each of layers b), c) and d) comprise a compound of formula I, or if the claims are met by a device in which at least one of layers b), c) and d) comprises a compound of formula I.

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 46-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakon et al. (US 5,077,142) in view of Schomaker et al. in J. Org. Chem., Vol. 66, pp. 7125-7128 (2001).

This rejection is applied subject to clarification of the claim limitations. This rejection applies if the claim limitations are met by a device having the recited layers in which at least one of layers b), c) and d) comprises a compound of formula I.

Sakon et al. disclose compounds of the general formula  $(B')_m-(Ar)_n$  for use in an organic compound layer of an electroluminescent device comprising one or more organic compound layers sandwiched between an anode and a cathode. B' may be pyrimidine and Ar may be benzene, biphenyl, methoxybenzene or naphthalene. See, for example, column 2, line 21-c. 6, l. 45. Pyrimidine compounds having three aryl group substituents as within the scope of formula (I) as required for the device of present independent claim 46 are within the scope of Sakon's general formula.

Sakon et al. provide a specific example of a pyrimidine compound having four phenyl groups as substituents (see the compound represented by formula 146 in columns 67-68). Sakon's compound of formula 146 is a compound of Sakon's general formula wherein B' is pyrimidine, Ar is benzene, m is 1 and n is 4. Pyrimidine compounds within the scope of formula having three aryl group substituents per the present claims would have been obvious to one of ordinary skill in the art at the time of the invention given Sakon's definitions of B', Ar, m and n, Sakon's compound of formula 146 and Sakon's compounds such as those of formulae 9 and 10 in columns 15-16 and formula 148 in columns 67-68. Sakon's compound of formula 10 is a compound in which B' is a benzene ring, m is 1, n is 4, and the four Ar groups are in the same pattern on the benzene ring as on the pyrimidine ring in the compound of formula 146. Sakon's compound of formula 9 is a compound in which B' is a benzene ring, m is 1, n is 3, and the three Ar groups are in the same pattern as provided by W, X and Y in present formula (I). Sakon's compound of formula 148 is a compound in which B' is a triazine ring, m is 1, n is 3, and the three Ar groups are in the same pattern as provided by W, X and Y in present formula (I). It

would have been an obvious modification to one of ordinary skill in the art at the time of the invention to make pyrimidine compounds of Sakon's general formula in which B' is pyrimidine, m is 1, and n is 3. There are only three possible substitution patterns for such a substituted pyrimidine, and one of ordinary skill in the art at the time of the invention would have reasonably expected that a 2,4,6-Ar-substituted pyrimidine would be light-emissive and could be used for Sakon's purposes. Further, one of ordinary skill in the art at the time of the present invention, having knowledge of Sakon's disclosure, and having knowledge of the teachings of Schomaker et al. regarding methods of providing 2,4,6-aryl-substituted pyrimidines, would have been able to make 2,4,6-Ar-substituted pyrimidines within Sakon's general formula. A 2,4,6-Ar-substituted pyrimidine within the scope of Sakon's general formula wherein Ar is biphenyl (one of the four possibilities for Ar as recited at c. 2, l. 63-64 of Sakon's patent) is within the scope of present formula (I) as defined in claim 46, and also meets the limitations of the compound as required for the device of claims 47-53.

With respect to the device structure recited in claim 46, Sakon's electroluminescent devices have at least a luminescent layer sandwiched between an anode and a cathode. The luminescent layer comprises a compound of Sakon's general formula (B')<sub>m</sub>-(Ar)<sub>n</sub>. The device may further comprise a separate hole transporting layer between the anode and the luminescent layer, and a separate electron transporting layer between the cathode and the luminescent layer. For example, see Fig. 1, Fig. 2, Fig. 3, column 2, lines 21-40, c. 77, l. 18-47, and c. 78, l. 52-c. 79, l. 30.

6. Claims 46-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakon et al. (US 5,077,142) in view of Schomaker et al. in J. Org. Chem., Vol. 66, pp. 7125-7128 (2001), as applied to claims 46-53 above, and further in view of Fink et al. (US 6,352,791 B1).

Sakon et al. suggest pyrimidine compounds substituted with three phenyl groups wherein the phenyl group may be unsubstituted (when Ar is benzene) or substituted with a phenyl group (when Ar is biphenyl). Schomaker et al. describe a method by which aryl groups may be substituted on a pyrimidine ring at the 2, 4 and 6 positions.

Sakon et al. do not teach a terphenyl group for Ar as necessary to provide substituted pyrimidine compounds per applicant's originally elected species and within the scope of present claims 46-53 (e.g. as when the compound is a compound of formula IV as defined in claim 53 wherein each of  $W^3$ ,  $X^3$  and  $Y^3$  is biphenyl and all other variables are H). The closest compound within the scope of Sakon's general formula is a compound wherein B' is pyrimidine, m is 1, n is 3, Ar is biphenyl, and the Ar groups are at positions 2, 4 and 6 of the pyrimidine ring.

Fink et al. disclose compounds for use in an electroluminescent device wherein the compounds have a triazine ring substituted with aromatic substituents. Fink's compounds of formula (I) as shown in column 2 encompass compounds of Sakon's general formula wherein B' is triazine, m is 1, n is 3 and Ar is phenyl (benzene) or biphenyl (see the first and fifth formulae set forth for the R variables in col. 2 of the Fink patent). Fink et al. also teach that the three aromatic substituents on the triazine ring may be terphenyl groups (see the fourth formula set forth for the R variables in col. 2 of the Fink patent). Given Sakon's disclosure of aryl-substituted triazine and pyrimidine compounds for use in an electroluminescent device, and



given Fink's disclosure of phenyl, biphenyl or terphenyl as suitable substituents to provide aryl-substituted triazine compounds for use in an electroluminescent device, it would have been an obvious modification to one of ordinary skill in the art at the time of the invention to make compounds similar to those of Sakon's general formula having pyrimidine for B', m is 1, n is 3, but having terphenyl, instead of phenyl (benzene) or biphenyl, for Ar. One of ordinary skill in the art would have reasonably expected that terphenyl-substituted compounds could be used for the same purpose as phenyl- or biphenyl-substituted compounds. Sakon's compounds are taught for use in a luminescent layer which may also function as an electron transporting layer, and Fink's compounds are taught for use in an electron-conducting layer that may also function as a light-emitting layer. Further, one of ordinary skill in the art at the time of the invention would have recognized that Schomaker's method could be modified to provide terphenyl groups, instead of phenyl groups, at the 2, 4 and 6 positions of pyrimidine.

7. Applicant's arguments filed November 11, 2010, and December 10, 2010, have been fully considered but they are not persuasive.

Line 1 of claim 46 has been amended to recite "in this order", thus limiting the device to one in which a)-e) are present in the order listed. Accordingly, the examiner's prior interpretation of the claims as encompassing devices in which light emitting layer c) also functions as electron transporting layer d) no longer applies. However, with respect to applicant's arguments that the examiner's prior interpretation constituted reading a limitation into the claims, the examiner points out that if the examiner had agreed with applicant's

arguments regarding the scope of previous claim 46 (i.e. that layers c) and d) were necessarily different layers), the examiner would have been reading a limitation into the claims. It would have been improper for the examiner to interpret the previous claims so as to exclude embodiments in which layer c) also functions as layer d) from the scope of the claims. The examiner's prior interpretation gave the previous claims their broadest reasonable interpretation in light of the specification, as the examiner is required to do.

With respect to the present claim limitations, it is not clear if applicant intends the claims to be limited to devices in which each of layers b), c) and d) comprise a compound of formula I, or to devices in which at least one of layers b), c) and d) comprises a compound of formula I. For devices in which layers b), c) and d) are three distinct layers, as required by the "in this order" language that has been added to line 1 of claim 46, it is the examiner's position that devices in which each of b), c) and d) comprise a compound of formula I, or in which b) and/or d) comprise a compound of formula I, are not supported by the original disclosure. Applicant's arguments regarding support have been fully considered, and the entire original disclosure has been taken into consideration.

As stated in the first paragraph of the specification, the invention relates in particular to devices comprising blue-emitting organo-electroluminescent layers comprising compounds containing one or more pyrimidine moieties. Teachings throughout the specification focus on the light emitting capabilities of the pyrimidine compounds, and the use of the pyrimidine compounds in the light emitting layer of a device. For example, see page 35, lines 20-23 and 26-32, p. 36, l. 12-31, and p. 39, l. 12-15. While page 35 mentions that the light emitting

compounds of the invention are also capable of injecting/transporting holes and injecting/transporting electrons, this teaching is present in a portion of the specification related to the use of the compounds in the light emitting layer. In the paragraphs at page 36, line 32, through page 39, line 11, the specification teaches numerous compounds that can be used in separate hole injecting and/or transporting layers, and in separate electron transporting layers, with no reference to pyrimidine compounds. Further, in all the device examples set forth in the original disclosure, the devices containing separate/distinct layers b), c) and d) use a pyrimidine compound in layer c), but do not use a pyrimidine compound in layer b) or in layer d).

With respect to the prior art rejections, applicant argues that Sakon generically discloses hundreds of organic compounds, that none of the specific compounds disclosed by Sakon are the same as the pyrimidine compounds required by the present claims, that the examiner is using impermissible hindsight to create the presently required compounds from Sakon's disclosure, and that without any guidance from Sakon to arrive at the presently required compounds, it would have been impossible to create compounds with predictable properties that would direct one of ordinary skill to the presently required compounds.

Applicant also argues that the examiner's reasons for relying on the Schomaker reference are not clearly articulated, but that it appears Schomaker is relied upon to support the rejection based on Sakon. Applicant argues that one of ordinary skill in the art would not turn to Schomaker after reading Sakon, absent impermissible hindsight. Applicant argues that Schomaker is not related to electroluminescent devices, and therefore there is no reason why one of ordinary skill in the art would look to Schomaker after reading Sakon.

Biphenyl-substituted pyrimidine compounds are suggested by Sakon's teachings (B' may be pyrimidine and Ar may be biphenyl as taught, e.g., in column 2). Compounds having pyrimidine substituted by three biphenyl groups are within the scope of Sakon's formula I', and 2,4,6-Ar-substituted pyrimidines are within the scope of Sakon's disclosure. Pyrimidine compounds of present formula (I) would have been obvious to one of ordinary skill in the art at the time of the invention given Sakon's disclosure, and use of such compounds in the luminescent layer of an electroluminescent device would have been obvious to one of ordinary skill in the art at the time of the invention given Sakon's disclosure. The Schomaker reference is relied upon by the examiner to demonstrate that methods capable of making 2,4,6-Ar-substituted pyrimidines were known in the art at the time of the present invention. Although Schomaker's disclosure is not directed to electroluminescent devices, it is relevant to the art of organic compound synthesis. The art of organic compound synthesis is relevant to the art of electroluminescent devices that utilize organic compounds since knowledge regarding the synthesis of organic compounds is relevant to the manufacture of organic compounds suggested for use in organic electroluminescent devices. Sakon's disclosure suggests Ar-substituted pyrimidine compounds and encompasses 2,4,6-Ar-substituted pyrimidine compounds, but does not explicitly disclose the synthesis of a 2,4,6-Ar-substituted pyrimidine. Schomaker's disclosure sets forth a method for making 2,4,6-Ar-substituted pyrimidine compounds, and would have been relevant art to one of ordinary skill in the art interested in making 2,4,6-Ar-substituted pyrimidines within the scope of Sakon's disclosure.

With respect to the rejection made further in view of Fink et al., applicant argues that Fink discloses triazine compounds and, alone or in combination with Sakon, does not disclose or suggest the pyrimidine compounds required by the present claims. Applicant again argues that the examiner is relying upon impermissible hindsight, and that without any guidance in any of the applied references to arrive at the presently required compounds, it would have been impossible to create compounds with predictable properties that would direct one of ordinary skill to the presently required compounds.

With respect to both prior art rejections and applicant's arguments regarding impermissible hindsight, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicant further argues unexpected properties based on the Rule 132 Declaration filed March 09, 2009, which has been previously considered by the examiner and addressed on the record. Given the most recent amendment to the claim, the examiner also notes that the devices set forth in the Declaration are not commensurate in scope with the present claims.

If the claims are interpreted as requiring each of layers b), c) and d) to comprise a compound of formula I, the data provided are not commensurate in scope with the claims because none of the tested devices has a pyrimidine compound in each of these layers. However, the issue of unexpected results is not germane if the claims require each of layers b), c)

and d) to comprise a compound of formula I since the prior art is not applied against such an embodiment.

If the claims are interpreted as requiring at least one of layers b), c) and d) to comprise a compound of formula I, the data provided are not commensurate in scope with the claims because the tested devices comprise a compound of formula I only in layer d), whereas the claims encompass devices in which the layer comprising a compound of formula I is layer b), or layer c), instead of layer d). The data set forth in the Declaration do not demonstrate that the pyrimidine compounds provide unexpected results compared to the similar triazine compounds when used for the purpose taught by Sakon et al.

With respect to devices in which the compound of formula I is present in layer d), but not in layers b) and c), the data also do not demonstrate unexpected results commensurate in scope with the claims because the composition of the light emitting layer of the claimed device is not limited to the compositions utilized in the tested devices. In fact, the application as originally filed does not suggest using the iridium complexes that are used as emitters in the devices of the Declaration, nor do the applied references suggest using the iridium complexes.

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 7:00 a.m. to 3:30 p.m. Monday and Wednesday-Friday.

The current fax number for all official faxes is (571) 273-8300. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

/Marie R. Yamnitzky/  
Primary Examiner, Art Unit 1786

MRY  
February 02, 2011